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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/790,759	03/03/2004	Eiji Maruyama	57810-088	2908

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McDERMOTT, WILL & EMERY  
600 13th Street, N.W.  
Washington, DC 20005-3096

EXAMINER
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MOWLA, GOLAM

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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02/19/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/790,759

**Applicant(s)**

MARUYAMA, EIJI

**Examiner**

GOLAM MOWLA

**Art Unit**

1795

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 November 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 8-11, 14 and 19-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-11, 14 and 19-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/S508)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/11/2008 has been entered.

### ***Response to Amendment***

2. Applicant's amendment of 11/11/2008 does not place the Application in condition for allowance.
3. Claims 8-11, 14 and 19-20 are pending. Applicant has amended claims 8 and 19, and cancelled claims 1-7, 12-13 and 15-18.
4. The amendment filed 11/11/2008 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Claim 8 and 19 add the limitation "wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) and a second peak having an intensity ( $I_2$ ) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is around 0.5 excluding 0.46,"

which is not supported by the original disclosure as filed. The original specification does not provide any support as to whether intensity ratio of 0.46 is excluded.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Status of the Objections or Rejections***

5. Due to Applicant's amendment of claims 8 and 19, all rejections from the office Action mailed on 08/12/2008 are withdrawn. However, upon further consideration, a new ground of rejection is presented below.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 8-11, 14 and 19-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 8 and 19 add the limitation "wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) (about 2.5) and a second peak having an intensity ( $I_2$ ) (about 5.5) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is around 0.5 excluding 0.46," which is not supported by the original disclosure as filed. The original

specification does not provide any support as to whether intensity ratio of 0.46 is excluded.

***Claim Rejections - 35 USC § 103***

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. Claims 8-11, 14, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted prior art in view of Vink et al. ("On the homogeneity of sputter-deposited ITO films ...microstructure" - Thin Solid Films 266 (1995) pp145-151) and Adurodija et al. ("Effect of Sn doping on the electronic transport mechanism of indium-tin-oxide films grown by pulsed laser deposition coupled with substrate irradiation" - J. Appl. Phys. 88 (2000) pp 4175-4180). Supporting evidence is provided by Neerincx et al. ("Depth profiling of thin ITO films by grazing incidence X-ray diffraction" - Thin Solid Films 278 (1996) pp12-17),

Regarding claims 8, 14 and 19, Applicant's admitted prior art discloses (See Background of the invention; pages 2, lines 1-19; see also fig. 7) a photovoltaic device (fig. 7; page 2, lines 1-19) comprising:

- a first conductivity type or n-type single-crystalline silicon semiconductor substrate (n-type single-crystalline silicon substrate 101; fig. 7; page 2, lines 1-19) having a front surface (top surface on which i-type amorphous silicon layer 102 is disposed) and a back surface (surface on which back

electrode 106 is disposed; see fig. 7) and receiving light incident from the side of said front surface;

- a substantially intrinsic first amorphous silicon semiconductor layer (i-type amorphous silicon layer 102; fig. 7; page 2, lines 1-19) formed on said front surface (top surface; see fig. 7) of said single-crystalline silicon semiconductor substrate (101), the substantially intrinsic first amorphous silicon semiconductor layer (102) consisting of a single layer (see fig. 7);
- a second conductivity type or p-type second amorphous silicon semiconductor layer (a p-type amorphous silicon layer 103; fig. 7; page 2, lines 1-19) formed on said first amorphous silicon semiconductor layer (102); and
- a transparent conductive film (transparent conducting film 104; fig. 7; page 2, lines 1-19) consisting of indium-tin-oxide (ITO; page 2, lines 5-6), formed on said second amorphous silicon semiconductor layer (103), wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) (about 2.5) and a second peak having an intensity ( $I_2$ ) (about 5.5) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is around 0.5 excluding 0.46 ( $2.5/5.5=0.4545$ ).
  - wherein a collector (collector 105; fig. 7; page 2, lines 9-13) is formed on the transparent conductive film (104).

However, the admitted prior art is silent as to whether the indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein

said indium oxide layer contains Sn, and the content of Sn with respect to In in said indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight.

Vink discloses an indium tin oxide film suitable for use in optoelectronic applications as a transparent conductor (Introduction, 1st paragraph). The x-ray diffraction pattern of one such film, i.e., a film that is annealed and sputter-deposited at room temperature according to the teachings of Vink et al., appears in Figure 1 of Neerincx et al. As shown in Figure 1, this film has a (222) plane orientation with two (222) peaks ("doublet-type peak profile," figure caption) in its x-ray diffraction spectrum. Further, Vink et al. report results showing that annealed, tin oxide films sputter deposited at room temperature on tin oxide films have low intrinsic stress (Conclusion paragraph, 2<sup>nd</sup> to last sentence). Vink et al. further disclose that the use of indium tin oxide films with low internal stress is advantageous to prevent deformation and fracture (Introduction, 1<sup>st</sup> paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the ITO film of Vink in the photovoltaic device of the admitted prior art in order to prevent deformation and fracture.

However, the modified device of admitted prior art lacks the content of Sn in the indium tin oxide layer with respect to In is at least about 2 percent by weight and not more than about 7 percent by weight.

Adurodija teaches a series of composition for ITO films that may be used in "many optoelectronic applications, including flat panel displays and solar cells"

(Introduction, first paragraph). Adurodija shows in Figure 4a that the carrier concentration of these films increases with weight % of Sn from 0-6 wt. % and then either decreases or levels off from 6-10 wt. % Sn. Thus, Adurodija et al. show in this figure that the maximum carrier concentration for these films occurs around 6 wt. % Sn. Adurodija et al. disclose in first paragraph of the introduction that high carrier concentration and low resistivity are optimal for use in solar cell applications as transparent conductors.

It would have been obvious to one of ordinary skill in the art at the time of the invention to choose a composition of the tin oxide layer used as the transparent conductive layer in the device of the admitted prior art that is around 6 wt. % Sn as instructed by Adurodija in order to optimize the carrier concentration of the film.

Regarding claims 9 and 20, said (222) peaks in Figure 1 of Neerincx et al. include: a first peak having an X-ray diffraction angle,  $2\theta$ , of about  $30.1 \pm 0.1$  degrees, and a second peak having an X-ray diffraction angle,  $2\theta$ , of about  $30.6 \pm 0.1$  degrees.

Regarding claim 10, the ratio ( $I_1/I_2$ ) of the intensity of said first peak ( $I_1 = 2.5$ , in arbitrary units, according to Figure 1 of Neerincx et al.) to the intensity of said second peak ( $I_2 = 5.5$ , in arbitrary units, according to Figure 1) is roughly 0.4545.

Regarding claim 11, the ratio ( $I_1/I_2$ ) of the intensity of said first peak ( $I_1 = 2.5$ , in arbitrary units, according to Figure 1 of Neerincx et al.) to the intensity of said second peak ( $I_2 = 5.5$ , in arbitrary units, according to Figure 1) is roughly 0.4545.

***Response to Arguments***

10. Applicant's arguments filed on 11/11/2008 have been fully considered but they are not persuasive.

Applicant argues that "the proposed combination of AAPA, Vink, Adurodija and Neerinc fails to disclose the limitations of claims 8 and 19 regarding "the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is around 0.5 excluding 0.46"

The Examiner respectfully disagrees. Neerinc's first peak has an intensity of 5.5 and Neerinc's second peak has an intensity of 2.5, and thus, the ratio of  $I_1/I_2$  of Neerinc is 0.4545 and excludes 0.46.

***Correspondence/Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GOLAM MOWLA whose telephone number is (571) 270-5268. The examiner can normally be reached on M-F, 0900-1700 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ALEXA NECKEL can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

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/G. M./

Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795